

## Blood Pressure Control in Hypertensive Patients in the “Hiperdia Program”: A Territory-Based Study

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### Abstract

**Background:** Systemic hypertension is highly prevalent and an important risk factor for cardiovascular events. Blood pressure control in hypertensive patients enrolled in the Hiperdia Program, a program of the Single Health System for the follow-up and monitoring of hypertensive patients, is still far below the desired level.

**Objective:** To describe the epidemiological profile and to assess blood pressure control of patients enrolled in Hiperdia, in the city of Novo Hamburgo (State of Rio Grande do Sul, Brazil).

**Methods:** Cross-sectional study with a stratified cluster random sample, including 383 adults enrolled in the Hiperdia Program of the 15 Basic Health Units of the city of Porto Alegre, conducted between 2010 and 2011. Controlled blood pressure was defined as  $\leq 140$  mmHg  $\times$  90 mmHg. The hypertensive patients were interviewed and their blood pressure was measured using a calibrated aneroid device. Prevalence ratios (PR) with 95% confidence interval, Wald's  $\chi^2$  test, and simple and multiple Poisson regression were used in the statistical analysis.

**Results:** The mean age was  $63 \pm 10$  years, and most of the patients were females belonging to social class C, with a low level of education, a sedentary lifestyle, and family history positive for systemic hypertension. Diabetes mellitus (DM) was observed in 31%; adherence to the antihypertensive treatment in 54.3%; and 33.7% had their blood pressure controlled. DM was strongly associated with inadequate BP control, with only 15.7% of the diabetics showing BP considered as controlled.

**Conclusion:** Even for hypertensive patients enrolled in the Hiperdia Program, BP control is not satisfactorily reached or sustained. Diabetic hypertensive patients show the most inappropriate BP control. (Arq Bras Cardiol. 2014; 102(6):571-578)

**Keywords:** Hypertension / complications; Risk factors; Hypertension / epidemiology; Government Programs; Epidemiological Monitoring; Medication Adherence.

### Introduction

Chronic non-communicable diseases (CNCDs) represent one of the major health challenges for the global development in the coming decades<sup>1</sup>. Among them, systemic hypertension is an important risk factor for cardiovascular diseases and is present in 69% of patients with a first myocardial infarction, in 77% of patients with a first stroke, in 74% of patients with chronic heart failure, and in 60% of patients with peripheral artery disease<sup>2</sup>.

Blood pressure control in hypertensive patients is closely related to adherence to the treatment prescribed.

Medication non-adherence is a major concern for health care professionals and stakeholders, so that studies are required to improve adherence to antihypertensive treatments, especially in hypertensive patients at a high cardiovascular risk. In these patients, control of complications may significantly reduce mortality for these diseases, as well as the costs of treating these complications<sup>3</sup>. Additionally, an inadequate blood pressure control may increase the risk of hypertensive crises with the need for hospitalization<sup>4</sup>. Several factors may be related to adherence, including the patients' characteristics, quality of the doctor-patient relationship, severity of disease, access to health care, and specific factors related to the drug prescription<sup>5</sup>.

Thus, the objective of this study is to describe the epidemiological profile of and to evaluate blood pressure control in patients enrolled in the Hiperdia Program, analyzing their association with socioeconomic aspects; cigarette smoking and alcohol intake; family history for SH; treatment adherence; awareness of adequate practices to health; and participation in health education groups – involving patients with hypertension and diabetes mellitus, and performance of physical activities in a mid-sized city in Southern Brazil.

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## Methods

This is a cross-sectional study with a territory-based random sample stratified by Basic Health Unit (*Unidade Básica de Saúde* – UBS), comprising the Basic Health Care Network of Novo Hamburgo (State of Rio Grande do Sul, Brazil). All 15 UBS of the city were included, as shown in Table 1. A proportional raffle was carried out according to the number of patients enrolled in Hiperdia<sup>6</sup> in each UBS, ordered in numbered tables for each unit. The Hiperdia Program was developed by the Ministry of Health for the enrollment, follow-up and assessment of hypertensive patients, generating quantitative reports according to the patients' age range, gender, medications used, and follow-up of blood pressure. Data inclusion is in charge of the city health departments.

The following parameters were used for the calculation of the sample size: prevalence of systemic hypertension of 28%, 95% CI, and acceptable error of 5%, thus giving a total of 383 patients. Initially, a screening was made in the Hiperdia data base, to remove double-entered patient data due to errors in their name and family name spelling, patients enrolled in more than one UBS, and those diagnosed exclusively with diabetes mellitus. The subjects included were patients 20 years old or older, of both genders, enrolled in the Hiperdia Program, and diagnosed with hypertension ( $\geq 140$  mmHg  $\times$  90 mmHg) or hypertension plus diabetes mellitus ( $\geq 130$  mmHg  $\times$  80 mmHg). Patients institutionalized in hospitals or nursing homes, those imprisoned, or who had moved to other UBS zone or other city when the research questionnaire was administered, were excluded from the study.

The instruments used for data collection comprised a structured questionnaire including questions regarding the

socioeconomic identification of the subject enrolled as hypertensive in Hiperdia, according to the Brazil Economic Classification Criterion (BECC)<sup>7</sup>; awareness about health care measures; risk factors such as cigarette smoking and sedentary lifestyle; family history; presence of DM; perception of the disease; and treatment adherence as assessed by the Morisky test<sup>8</sup>. The instrument was administered by trained interviewers, nurses or nursing technicians.

Blood pressure (BP) was measured using a Solidor aneroid device, batch BE15B, certified by Inmetro, according to the technique proposed by the VI Brazilian Guidelines of Systemic Hypertension<sup>9</sup>. Individual appointments for each study subject were scheduled in their respective UBS with the support of the City Health Department or by means of a domiciliary visit. Two BP measurements were taken; the first one after half the questionnaire had been administered, and the second one, after the questionnaire had been terminated, in the UBS itself or in the patients' home, when they could not attend the visit in the UBS. Data were collected between June 2010 and April 2011. For the quality control of data collection, the questionnaire was re-administered in 4% of the total sample, also selected in a random fashion according to the proportion of patients in each UBS, thus ensuring that every unit was evaluated. BP was also measured up to five days after the first data collection.

The interviewers participated in preparatory meetings for discussion and training so that the questionnaire would be correctly filled up, by administering it in a pilot study. Sphygmomanometer handling and Korotkoff sound auscultation were trained in practical workshops guided by an instructions manual.

**Table 1 – Patients registered in the Hiperdia Program of Novo Hamburgo (RS) — 2011**

UBS	Hypertension	Hypertension + DM	Total	Stratified sample	Unanswered questionnaires	Answered questionnaires
Santo Afonso	828	155	983	82	7	75
Hamburgo Velho	296	69	365	30	2	28
Hamburgo Velho	225	64	289	24	2	22
Guarani	178	31	209	17	1	16
Canudos	554	135	689	58	5	53
Iguaçu	67	11	78	7	0	7
Lomba Grande	250	68	318	26	2	24
Rondônia	87	14	101	9	1	8
Kephas	219	64	283	24	2	22
Roselândia	128	28	156	13	1	12
Rincão	320	41	361	30	2	28
Kraemer	78	45	123	10	1	9
Redentora	80	15	95	8	1	7
Boa Saúde	211	85	296	25	2	23
Liberdade	201	40	241	20	1	19
<b>TOTAL</b>	<b>3.722</b>	<b>865</b>	<b>4.587</b>	<b>383</b>	<b>30</b>	<b>353</b>

Data were doubled entered in the Epidata program and analyzed using the Statistical Package for the Social Sciences (SPSS), version 19.0. The analysis included the calculation of measures of frequency; percentage for categorical variables and standard deviation for continuous variables contained in the questionnaire; and BP measurement. The measure of effect used was the prevalence ratio (PR), with 95% confidence interval, and Wald's  $\chi^2$  test with simple and multiple Poisson regression.

Multivariate analysis was carried out using Poisson regression, considering  $p < 0.20$  for the control of confounding factors, whose variables analyzed were: gender; age; level of education; socioeconomic classification; physical activity; cigarette smoking; time of awareness of hypertension; awareness of healthy habits regarding the use of salt; regular visits to the doctor; alcohol use; and presence of DM.

The research project was approved by the Research Ethics Committee under protocol no. UP 4344/09. All interviewees gave written informed consent.

## Results

The data from 353 patients diagnosed with SH or SH plus DM were studied, because 30 individuals of the sample either refused to participate in the research, or had moved, or were institutionalized. Table 2 shows the sociodemographic characteristics of the study sample. Most of the sample was comprised of women (69.4%) and patients older than 60 years (62.1%); 64.7% of the interviewees belonged to social classes C1 and C2; 31% were diagnosed with DM. Blood pressure was not controlled in 63.3% of the hypertensive patients.

In relation to the history of hospitalization in the past two years, 27.1% reported to have been hospitalized for SH or for a related condition. Of these, 4.1% had been hospitalized twice and 1.9%, more than three times.

Of the total of respondents, only 51 reported to participate in groups of hypertensive patients, which represent 47.1% of patients with controlled BP.

Table 3 shows the distribution of variables in relation to BP control as well as crude and adjusted prevalence ratios. In the crude analysis, BP control was significantly associated with the female gender, performance of physical activities, absence of DM, and awareness of the diagnosis of hypertension for less than 10 years.

In the adjusted analysis, only the presence of DM remained as a factor associated with BP control, and only 15.7% of hypertensive patients with diabetes showed controlled BP in comparison to 41% of controlled BP among non-diabetic hypertensive patients ( $p = 0.011$ ).

Of the hypertensive patients assessed, 96.9% were aware of the diagnosis of SH for  $14 \pm 9$  years and 54.3% reported treatment adherence. There was no statistically significant difference between non-adherent and adherent patients in relation to BP control ( $p = 0.257$ ).

As regards awareness of important measures to maintain good health, 87% reported to be aware of the importance of a healthy diet, 70.8% reported to be aware that they should control salt intake, and 59.5% said they were aware they should see the doctor regularly (Figure 1).

## Discussion

In this cross-sectional study, we observed that, albeit receiving antihypertensive treatment, the hypertensive patients assessed showed unsatisfactory blood pressure levels, with low BP control and insufficient treatment adherence. However, they were aware of the importance of adopting good lifestyle practices.

The proportion of patients with controlled BP was similar to that of other studies<sup>10,11</sup> corrected for normal BP parameters for hypertensive and diabetic hypertensive patients, and was much lower than that found in individuals seen in community-based services in the United States<sup>12</sup>, where 71.4% of hypertensive patients were controlled. However, results more similar to ours were found in a study conducted in 26 countries<sup>13</sup>, with 23.7% of patients with controlled BP. The changes recommended by national<sup>8</sup> and international<sup>14</sup> guidelines are necessary to improve BP control.

In a study with non-adherent patients<sup>3</sup>, adherence reached 72.3% after mail interventions. Another study, with Finnish public workers<sup>5</sup>, found 79.6% of treatment adherence in a cohort that analyzed recordings of pharmacy sales; and yet another, using telephone survey<sup>15</sup>, reported adherence of 61% of hypertensive patients. Rates of treatment adherence range from 50% to 90% among hypertensives<sup>16</sup>. In order to improve these rates, it is necessary to implement measures of primary health care<sup>17</sup>.

A significant association was observed between time of awareness of the diagnosis of systemic hypertension and BP control in the bivariate analysis, but not in the multivariate

**Table 2 – Characteristics of the sample of hypertensive patients enrolled in the Hiperdia Program of Novo Hamburgo (2011)**

Variables	Frequency (%)
Female gender	245 (69.4)
Age, mean $\pm$ standard-deviation	63 $\pm$ 10
Skin color	
White	316 (89.5)
Mixed	16 (4.5)
Black	21 (6.0)
Social class*	
B1 + B2	23 (6.5)
C1	86 (24.4)
C2	142 (40.3)
D + E	101 (28.8)
Level of education	
Illiterate/Elementary school (1st to 4th)	196 (57.8)
Elementary school (5th to 8th)	125 (36.9)
High school/College	18 (5.3)
Married/living with partner	226 (65.9)

\*Social class: Brazil Economic Classification Criterion, 2011.

**Table 3 – Variables distribution of patients registered in the Hiperdia Program in relation to controlled BP**

	N	Controlled BP	p* value	PR (95%CI)	Adjusted PR (95%CI)	p** value
<b>Gender</b>						
Male	108	25%	-	1.00	1.00	-
Female	245	37.60%	0.016	1.50 (1.04 a 2.16)	1.50 (0.81 a 2.79)	0.197
<b>Age</b>						
< 60 years	133	38.30%	-	1.00	1.00	-
≥ 60 years	220	30.90%	0.148	0.81 (0.60 a 1.08)	0.87 (0.57 a 1.33)	0.533
<b>Level of education</b>						
Up to 4th grade	196	29.60%	-	1.00	1.00	-
High school	125	38.40%	0.099	1.30 (0.95 a 1.77)	0.91 (0.59 a 1.40)	0.657
or above	18	33.30%	0.735	1.13 (0.57 a 2.24)	0.69 (0.26 a 1.82)	0.449
<b>Marital status</b>						
Married	226	32.70%	-	1.00	-	-
Other	117	34.20%	0.787	1.04 (0.76 a 1.43)	-	-
<b>ABEP Class</b>						
B1 + B2	23	34.80%	0.212	1.53 (0.79 a 2.97)	1.95 (0.47 a 8.15)	0.361
C1	86	41.90%	0.006	1.84 (1.19 a 2.84)	2.70 (1.32 a 5.52)	0.006
C2	142	36.60%	0.026	1.61 (1.06 a 2.45)	2.26 (1.22 a 4.54)	0.022
D + E	101	22.80%	-	1.00	1.00	-
<b>Physical activity</b>						
Do not perform physical activity	64	15.60%	-	1.00	1.00	-
Perform physical activity	164	36.00%	0.007	2.30 (1.26 a 4.21)	1.82 (0.95 a 3.45)	0.071
<b>Cigarette smoking</b>						
Do not smoke	266	36.10%	-	1.00	1.00	-
Smoker	27	25.90%	0.324	0.72 (0.37 a 1.37)	0.92 (0.31 a 2.77)	0.885
Former smoker	60	26.70%	0.187	0.74 (0.47 a 1.16)	0.93 (0.46 a 1.89)	0.839
<b>Alcohol intake</b>						
No	332	34.90%	-	1.00	1.00	-
Yes	21	14.30%	0.098	0.41 (0.14 a 1.18)	0.62 (0.15 a 2.56)	0.512
<b>Perceived health status</b>						
Very good/good/regular	311	34.10%	0.926	1.02 (0.64 a 1.64)	-	-
Poor/very poor	39	33.30%	-	1.00	-	-
<b>Diabetes</b>						
No DM	245	41.60%	< 0.001	2.65 (1.67 a 4.19)	2.39 (1.22 a 4.68)	0.011
With DM	108	15.70%	-	1.00	1.00	-
<b>Family history of SH</b>						
Negative	145	35.20%	-	1.00	-	-
Positive	197	34.00%	0.823	0.97 (0.72 a 1.30)	-	-
<b>Adherence</b>						
Adherent	189	36.00%	-	1.00	-	-
Non-adherent	159	30.20%	0.257	0.84 (0.62 a 1.14)	-	-
<b>Time of awareness of SH</b>						
> 10 years	164	25.60%	-	1.00	1.00	-
< 10 years	171	39.20%	0.009	1.53 (1.11 a 2.11)	1.13 (0.71 a 1.78)	0.610

continuation

Participation in groups

Do not participate	299	33.40%	-	1.00	-	-
Participate	51	35.30%	0.794	1.05 (0.70 a 1.58)	-	-

Lifestyle change

Healthy diet						
Did not mention	46	30.40%	-	1.00	-	-
Mentioned	307	34.20%	0.622	1.12 (0.71 s 1.79)	-	-
Salt intake control						
Did not mention	103	27.20%	-	1.00	-	-
Mentioned	250	36.40%	0.108	1.34 (0.94 a 1.91)	1.20 (0.78 a 1.84)	0.418
See doctor						
Did not mention	143	28.70%	-	1.00	-	-
Mentioned	210	37.10%	0.105	1.29 (0.95 a 1.77)	1.03 (0.69 a 1.54)	0.892

\*Wald's  $\chi^2$  test obtained in the Poisson's simple regression analysis.

\*\*Wald's  $\chi^2$  test obtained in the Poisson's multiple regression analysis.

DM: diabetes mellitus; SH: systemic hypertension; CI: confidence interval; BP: blood pressure; PR: prevalence ratio.

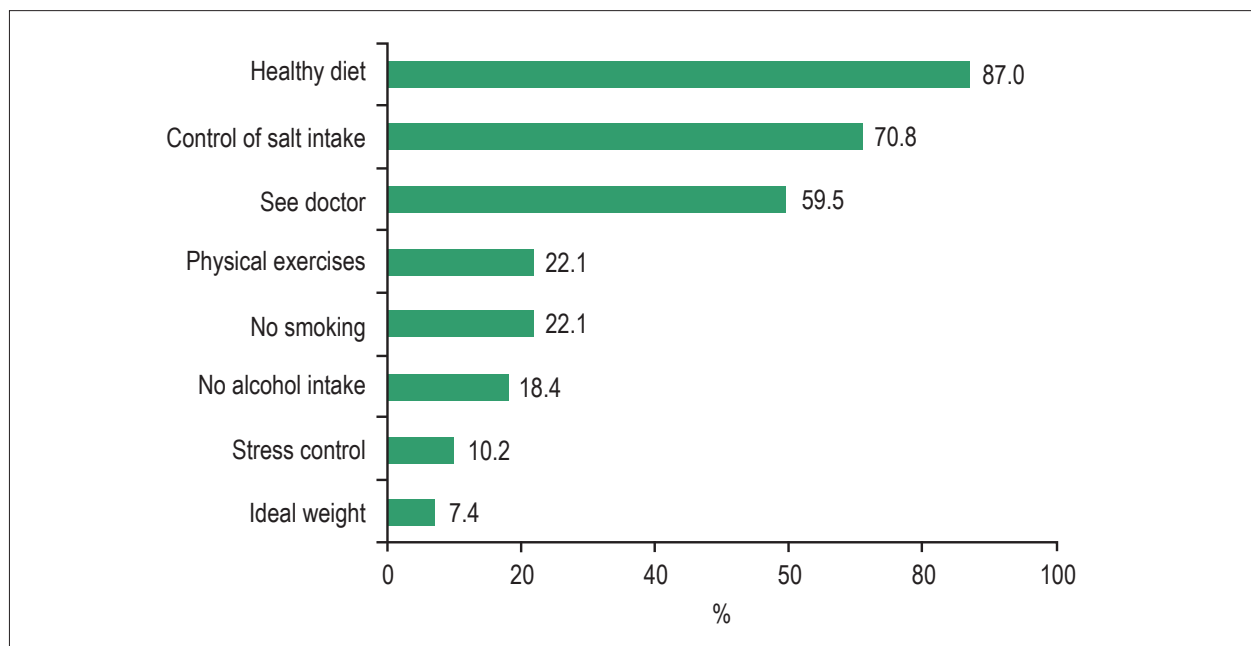


Figure 1 – Awareness of relevant measures to keep good health.

analysis. In another study, opposite results were found, with time of awareness of the diagnosis being associated with a poorer blood pressure control<sup>18</sup>.

Women comprised the major part of our study sample, like in other studies<sup>19-22</sup>, and they sustained better BP control in comparison to men (25% and 37.6%, respectively). Fucks's population-based study<sup>23</sup> found a greater number of hypertensive women, but a slightly smaller number of individuals above 60 years of age.

The proportion of women and elderly individuals enrolled in Hiperdia is greater than that of population-based studies, precisely because these populations tend to seek health services more frequently. This is important to help guide planning measures in the care of hypertensive patients, with possible active search of less represented populations, such as those of men and patients younger than 60 years of age.

In another study conducted in a group of UBS in São Paulo<sup>18</sup>, the percentage of BP control among men was 30.9%,



and 52.6% among women. These findings were better than ours, but worse than those of patients followed up in an outpatient service in Rio de Janeiro, where only 27% had controlled BP<sup>24</sup>.

The frequency of diabetes mellitus among the hypertensive patients analyzed was 31%, identical to that of another study<sup>13</sup> on the control of hypertension and cardiometabolic risk. Hypertension control, as assessed in a specialized service<sup>25</sup>, was found in only 13.4% of diabetic hypertensive patients. The presence of diabetes mellitus in hypertensive patients characterizes a scenario in which it is more difficult to control BP according to the parameters elected as ideal by the VI Brazilian Guidelines of Hypertension<sup>9</sup>. In our study, DM as a comorbidity was associated with worse BP control in hypertensive patients. In view of these findings, we conclude that diabetic hypertensive patients require closer follow-up and support from the health care team and their family in order to adhere to treatment and improve their lifestyle as a condition to achieve better results in their BP control.

The percentage of patients who had attended school up to the 4th grade was 57.8%, and 64.7% among individuals from economic classes C1 and C2. Fuchs et al<sup>23</sup>, Gus et al<sup>26</sup> and Piccini and Victora<sup>27</sup> found association between low level of education and hypertension, and stated that poor life conditions predispose to the development of diseases. For Piccini et al<sup>28</sup>, the level of education was associated with blood pressure control, with worse control among those had attended school for fewer years. This factor, associated with hypertension, may be classified as a modifiable risk factor.

The frequency of cigarette smoking and alcohol intake reported by the hypertensive patients was lower than that usually found in the literature<sup>10,18</sup>; still, alcohol intake was associated with poorer BP control.

In our study, more than half of the interviewees reported not to perform physical activities. This corroborates the findings of other studies<sup>10,18,29</sup>. Nonetheless, albeit reaching borderline significance in the adjusted analysis, physical activity contributed to BP control.

In our study, it was not possible to compare patients participating in groups of hypertensive individuals with those not participating, due to the low attendance rate and small number of groups formed in the UBS, where only 14.4% of the respondents reported to participate in group activities in the past year. This intervention has been proved useful in the control of these chronic diseases<sup>18,29,30</sup>.

We found evidences that most of the hypertensive patients remain with inadequate BP control, especially those also diagnosed with DM. The latter have an almost three-time higher possibility of not having controlled BP in comparison to those diagnosed with SH alone, like observed in the ACCORD study<sup>31</sup>, therefore deserving careful attention on the part of health care teams. Diabetic hypertensive patients have a two- to six-time higher risk of cardiovascular death than hypertensive patients without diabetes<sup>32</sup>.

An effective patient follow-up is one of the most difficult goals to achieve in Hiperdia, whether due to the physical distance between patients and the health care services, or to difficulties reported by professionals to reach these patients in their homes, or also due to the lack of patient awareness regarding SH and

DM. Also, these patients are strongly linked to factors of social vulnerability such as low level of education and lack of contact with the health care team; thus, the change in this panorama falls on the primary health care teams, with promotion and prevention actions, especially among diabetic hypertensive patients<sup>33</sup>.

It is important to consider possible study limitations characterized by measurement bias; current cigarette smoking and alcohol intake, whose percentages were much lower than those found in the literature; a possible influence of the observer, of the data collection environment, of the device used, and, finally, of the white coat effect. As regards the performance of physical activities, reverse causality bias may have occurred. Selection bias may also have occurred because the Hiperdia recordings of the 15 UBS do not include all hypertensive patients living in Novo Hamburgo. With the use of the Morisky test, recall bias may have occurred regarding the accuracy of the responses to the test. However, the findings showed low adherence, which seems to reflect real life.

Further research on Hiperdia and BP control is still necessary in the Brazilian Southern region. Our findings will help plan actions to improve the access of Hiperdia users to primary health care measures, such as: monitoring of diabetic hypertensive patients through monthly visits of community health care agents; quantitative and qualitative assessment of Hiperdia recordings, aiming to improve patient enrollment; implementation of the recommendations of the VI Guidelines of SH<sup>9</sup>, especially for diabetic hypertensive patients; automation of UBSs for full operation of the enrollment system; enrollment in the Health Clubs Project of the Ministry of Health; training of multidisciplinary teams (NASF); and enrollment in the Care of people with Chronic Diseases Network of the Ministry of Health<sup>34</sup>.

Based on our findings, we can conclude that blood pressure control in the patients studied is unsatisfactory and that this control is even harder in diabetic patients. Thus, a policy of emphasis on this group of patients should be developed.

## Author contributions

Conception and design of the research, Analysis and interpretation of the data, Statistical analysis, Writing of the manuscript and Critical revision of the manuscript for intellectual content: Souza CS, Stein AT, Bastos GAN, Pellanda LC; Acquisition of data: Souza CS, Bastos GAN; Obtaining financing: Pellanda LC.

## Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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## Study Association

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